

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

LIN

Serial No. 09/084,441

Filed: May 27, 1998

Title: OPHTHALMIC SURGERY METHOD USING
NON-CONTACT SCANNING LASER

Group Art Unit: 3739

Examiner: Michael Peffley

Client Reference: IN

Attorney Docket: 62075

AMENDMENT

October 21, 1999

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Responsive to the Official Action dated October 8, 1999, kindly
formally enter the following amendments and remarks.

IN THE CLAIMS

Kindly amend claims 1, 24-36, 39-45, 48-50, 56, 59, 61, 62, 69, 70,
76-79, 82, 84, 86, 90, 91, 92, 95, 96 and 100 as follows:

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1. A method of performing corneal refractive surgery by reshaping a portion of a corneal surface comprising the steps of:

selecting a laser having a pulsed output beam of predetermined ultraviolet wavelength and having an energy level [less than] of no greater than 10 mJ/pulse;

selecting a scanning mechanism for scanning said selected laser output beam, said scanning mechanism including a galvanometer scanning mechanism for controlling said laser beam into an overlapping pattern of adjacent pulses;

coupling said laser beam to a scanning device for scanning said laser beam over a predetermined surface;

focusing said scanning laser beam onto a corneal surface to a predetermined generally fixed spot size;

aligning the center of the said scanning laser beam onto the corneal surface with a visible aiming beam;

controlling the scanning mechanism to deliver the scanning laser beam in a predetermined overlapping pattern onto a plurality of positions on the corneal surface to photoablate or photocoagulate corneal tissue; and

removing from 0.05 to 0.5 microns of corneal tissue per pulse overlapped to remove tissue to a desired depth, whereby a patient's vision is corrected by the reshaping of the corneal surface of the patient's eye using a low power laser.

24. A method for performing ophthalmic surgery, comprising:
providing a laser outputting a pulsed laser beam having a repetition rate of at least 20 Hz, and an energy level of no greater than 10 mJ per pulse from an output coupler of said laser;

applying said pulsed laser beam onto corneal tissue; and
scanning said pulsed laser beam in a substantially overlapping pattern on said corneal tissue.

25. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam has a repetition rate of at least 50 Hz.

26. The method for performing ophthalmic surgery according to claim 24, wherein:

said substantially overlapping pattern is achieved using randomized scanning of said pulsed laser beam on said corneal tissue.

27. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam has an ultraviolet wavelength.

28. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam has a spot size on said corneal tissue of no greater than 1 mm.

29. The method for performing ophthalmic surgery according to claim 25, wherein:

said pulsed laser beam has a spot size on said corneal tissue of no greater than 1 mm.

30. The method for performing ophthalmic surgery according to claim 26, wherein:

said pulsed laser beam has a spot size on said corneal tissue of no greater than 1 mm.

31. The method for performing ophthalmic surgery according to claim 27, wherein:

said ultraviolet wavelength is in a range of 193 to 220 nm.

32. The method for performing ophthalmic surgery according to claim 24, wherein:

successive pulses of said pulsed laser beam are overlapped at least 50 percent.

33. The method for performing ophthalmic surgery according to claim 24, wherein:

said ultraviolet wavelength is in a range of 193 to 220 nm.

34. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam has a repetition rate in a range of 50 to 200 Hz.

35. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam is scanned synchronously with said pulses of said pulsed laser beam.

36. The method for performing ophthalmic surgery according to claim 24, wherein:

an area of corneal tissue 0.05 to 0.5 microns deep is removed with each pulse of said pulsed laser beam.

39. A method for performing ophthalmic surgery, comprising:
providing a laser outputting a pulsed laser beam having an energy level of no greater than 10 mJ per pulse from an output coupler of said laser; and
scanning said pulsed laser beam in a substantially overlapping pattern on corneal tissue.

40. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam has a spot size on said corneal tissue of no greater than 1 mm.

41. The method for performing ophthalmic surgery according to claim 39, wherein:

successive pulses of said pulsed laser beam are overlapped at least 50 percent.

42. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is pulsed at a repetition rate of at least 20 Hz.

43. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is pulsed at a repetition rate of at least 50 Hz.

44. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is scanned synchronously with said pulses of said pulsed laser beam.

45. The method for performing ophthalmic surgery according to claim 39, wherein:

an area of corneal tissue 0.05 to 0.5 microns deep is removed with each pulse of said pulsed laser beam.

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48. A method of performing laser ablation on tissue, said method comprising:

providing a laser having a pulsed output beam of ultraviolet wavelength and an output energy level of no greater than 10mJ per pulse from an output coupler of said laser;

providing a galvanometer scanner; and

controlling said pulsed output beam with said galvanometer scanner to provide a substantially overlapping pattern of beam pulses on said tissue.

49. The method of performing laser ablation on tissue according to claim 48, wherein:

an orientation of said substantially overlapping pattern is achieved using randomized scanning of said pulsed output beam on said tissue.

50. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has a pulse repetition rate of at least 20 Hz.

56. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is pulsed at a repetition rate of at least 50 Hz.

59. The method of performing laser ablation on tissue according to claim 50, wherein:

said pulsed output beam has a spot size on said tissue of no greater than 1mm.

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61. The method of performing laser ablation on tissue according to claim 49, wherein:

said pulsed output beam has a repetition rate of at least 20 Hz.

62. The method of performing laser ablation on tissue according to claim 57, wherein:

said pulsed output beam has a repetition rate of at least 20 Hz.

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69. An apparatus for ablating tissue, comprising:
a laser adapted to emit a pulsed output beam having an ultraviolet wavelength and a repetition rate of at least 50 Hz; and
a scanner constructed and arranged to control said pulsed output beam into a substantially overlapping pattern of beam pulses on said tissue.

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70. The apparatus for ablating tissue according to claim 69, wherein:
said substantially overlapping pattern of beam pulses has an orientation which is achieved using a randomized scanning of said pulsed output beam on said tissue.

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76. An ophthalmic surgery apparatus for performing corneal refractive surgery by reshaping a portion of a corneal surface, said apparatus comprising:
a laser adapted to emit a pulsed laser beam having an energy level of less than 10 mJ per pulse from an output coupler of said laser; and
a computer-controlled scanning device coupled to said laser to cause overlap of pulses of said pulsed laser beam on said corneal surface to achieve a smooth ablation of corneal tissue.

77. An ophthalmic surgery apparatus for performing corneal refractive surgery by reshaping a portion of a corneal surface according to claim 76, wherein:

said pulsed laser beam has a repetition rate of at least 20 Hz .

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78. A method of performing corneal refractive surgery by reshaping a portion of a corneal surface, said method comprising:

substantially overlapping a plurality of ultraviolet laser beam pulses over an area of a corneal surface sufficient to ablate a depth of between 0.05 and 0.5 microns of corneal tissue per ultraviolet laser beam pulse;

said laser beam pulses having an energy level of no greater than 10 mJ per pulse from an output coupler of said laser; and

said laser beam pulses having a pulse repetition rate of at least 50 pulses per second.

79. The method of performing corneal refractive surgery by reshaping a portion of a corneal surface according to claim 78, wherein:

said laser beam pulses have a wavelength in a range of 193 to 215 nm.

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82. An ophthalmic surgery apparatus, comprising:
a laser adapted to emit a pulsed beam of less than about 10 mJ per pulse at an output coupler of said laser; and

a computer-controlled scanning device coupled to said laser such that pulses of said beam are substantially overlapped to achieve a smooth ablation of corneal tissue.

84. The ophthalmic surgery apparatus according to claim 82, wherein:

said laser is adapted to emit a pulsed beam having an ultraviolet wavelength.

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86. The ophthalmic surgery apparatus according to claim 82,
wherein:

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said laser is adapted to emit a pulsed beam having a repetition rate
of at least 20 Hz.

90. A method for performing corneal refractive surgery by
reshaping a portion of a corneal surface, comprising:

selecting a laser having a pulsed output beam of ultraviolet
wavelength and having an energy level less than 10 mJ/pulse from an output
coupler of said laser;

selecting a scanning mechanism for scanning said laser output
beam;

coupling said laser beam to said scanning mechanism for scanning
said laser beam over a predetermined surface;

focusing said scanning laser beam onto said corneal surface;

controlling said scanning mechanism to deliver the scanning laser
beam in an overlapping pattern onto a plurality of positions on said corneal
surface to at least one of photoablate and photocoagulate corneal tissue; and

removing from 0.05 to 0.5 microns of corneal tissue per pulse
overlapped to remove tissue to a desired depth, whereby a patient's vision is
corrected by said reshaping of said portion of said corneal surface of said
patient's eye.

91. A method for performing ophthalmic surgery, comprising:

pulsing an ultraviolet laser beam having an output energy level of
no greater than 10 mJ/pulse from an output coupler of said laser;

applying said pulsing ultraviolet laser beam onto corneal tissue; and
scanning said pulsing laser beam in a purposefully substantial
overlapping pattern on said corneal tissue.

92. The method for performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam has a wavelength in a range of 193 to 215 nm.

95. The method of performing ophthalmic surgery according to claim 91, wherein:

said substantially overlapping pattern is achieved using a randomized scanning of said pulsing laser beam on said corneal tissue.

96. The method of performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam has a wavelength of 193 nm.

100. A method for performing photocoagulation on a corneal surface according to claim 99, wherein:

said infrared laser beam is emitted by a diode laser having a wavelength in a range of 1.9 to 2.5 μ m.

Kindly add the following new claims 105 and 106.

--105. The method for performing corneal refractive surgery according to claim 90, wherein:

said scanning mechanism comprises a galvanometer.

106. The method for performing corneal refractive surgery according to claim 90, further comprising:

aligning a center of said scanning laser beam onto said corneal surface with a visible aiming beam.--

Remarks

Claims 1-106 remain pending in the present application.

Objections to the preliminary amendments to the claims

In the Office Action, the Examiner objected to the technical presentation in which underlining and brackets were used to indicate earlier amendments to certain claims in this reissue application, and required a follow-up corrective amendment of the relevant claims. As such, the Applicants again present the minor amendments to claims 24-36, 39-45, 48-50, 56, 59, 61, 62, 69, 70, 76-79, 82, 84, 86, 90, 91, 92, 95, 96 and 100, and new claims 105 and 106, all as already considered by the Examiner. In particular, the entire text of each of the new reissue claims is now underlined and unchanged with respect to this Response.

The Applicant thanks the Examiner for having already considered the merits of each of these claims. With this technical correction, it is respectfully requested that the objection be withdrawn.

Rejection of claims 24-38, 42, 50, 51, 59, 61, 62, 77 and 86 under 35 U.S.C. §112, 1st paragraph.

In the Office Action, claims 24-38, 42, 50, 51, 59, 61, 62, 77 and 86 were rejected under 35 U.S.C. §112, 1st paragraph for allegedly lacking support in the specification for a recited feature.

In particular, the Examiner alleges that the claimed repetition rate of "at least 20 Hz" lacks proper support in the specification.

Specific support for the claimed feature can be found, for example, *inter alia*, in the parent application filed on December 3, 1992, on page 19, line 25 (copy attached for the Examiner's convenience), and in the present reissue application on page 11, line 32.

As disclosed in the December 3, 1992 parent application, an exemplary pulsed laser has a "high-repetition-rate [of] 20 – 100 Hz." This range

clearly supports the language "pulse repetition rate of at least 20 Hz" as recited in claims 24-38, 42, 50, 51, 59, 61, 62, 77 and 86. Therefore, all claims are in full compliance with the requirements of 35 U.S.C. §112, 1st paragraph.

Accordingly, the Applicant respectfully requests that the rejection be withdrawn.

Rejection of claims 3, 4 and 8-10 under 35 U.S.C. §112, 2nd paragraph.

In the Office Action, claims 3, 4 and 8-10 were rejected under 35 U.S.C. §112, 2nd paragraph for allegedly being indefinite.

In particular, the Examiner alleged that the range of energy level recited by claims 3, 4 and 8-10 was outside the range recited by claim 1 from which the rejected claims depend.

The typographical error in claim 1 is amended herein to now recite more clearly an energy level of no greater than 10 mJ/pulse (i.e., inclusive of 10 mJ/pulse), providing claim 1 with the same language already recited in current claims 3, 4 and 10 (which were previously allowed and published in the subject patent).

All claims being in full compliance with 35 U.S.C. §112, it is respectfully requested that the rejection be withdrawn.

Rejection of claims 69, 70, 73-75 and 99-103 under 35 U.S.C. §102(e).

In the Office Action, claims 69, 70, 73-75 and 99-103 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent 5,144,630 to Lin (hereinafter "'630 Patent").

The '630 Patent has common inventorship with the present application, and therefore is not "by another" as required by 35 U.S.C. §102(e).

In particular, 35 U.S.C. §102(e) provides, in pertinent part:

35 U.S.C. 102 Conditions for patentability; novelty and loss of right to patent.

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent **by another** filed in the United States before the invention thereof by the applicant for patent (Emphasis Added).

The '630 Patent and the present application share the same inventive entity, namely, J. T. Lin, both as a sole inventor. Thus, the '630 Patent is not "by another". See MPEP §2136.04. See also In re Land, 151 USPQ 621 (CCPA 1966) ("Another" means other than applicants").

Accordingly, since the '630 Patent is not prior art to the claims of the present application under 35 U.S.C. § 102(e), the present rejection relying on the '630 Patent is improper. Accordingly, the Applicant respectfully requests withdrawal of the rejection.

Rejection of claims 24-47, 69-80, 82-86, 89-98 and 106 under 35 U.S.C. §102(a).

In the Office Action, claims 69, 70, 73-75 and 99-103 were rejected under 35 U.S.C. §102(a) as allegedly being anticipated by International Publication No. WO 93/08877 (of international application number PCT/US92/09625) by Lai (hereinafter "Lai"). The Applicants did not receive a copy of the Lai reference with the Office Action, but have obtained a copy at their own expense.

It is respectfully submitted that Lai is not prior art to the claims of the present application because all claims are fully supported by the parent application filed on December 3, 1992.

In particular, the claim to priority of the present reissue application is of record, as acknowledged on the filing receipt for the present reissue application (copy attached). The present reissue application is a reissue of Serial No. 08/218,319, filed on March 25, 1994, now U.S. Patent No. 5,520,679, which is a CIP of Serial No. 07/985,617, filed on December 3, 1992 ("the Parent Application"), now abandoned. A claim of priority to the Parent Application has been and is hereby expressly made.

Moreover, as described in the Declaration And Power Of Attorney For Reissue Application By Assignee And Inventor filed with the Reissue application at pages 6 and 7, all claims are fully supported by the Parent

Application filed on December 3, 1992¹ and are entitled to the December 3, 1992 priority date.

¹ For the Examiner's convenience, citations to various supporting passages from the Parent Application filed on December 3, 1992 for each of the new claims of the reissue application are reproduced in their entirety herein below:

Support for New Claims

No new matter has been added by new claims 24 through 104. Support for each of the following new claims can be found in the parent Application Serial No. 07/985,617, filed on December 3, 1992, inter alia as follows:

New claim 24 at page 6, line 19, page 10, line 20, and page 19, line 25;
New claims 25, 49, 79, 84 and 95 at page 6, lines 12-13;
New claims 26, 50 and 96 at page 15, line 7;
New claim 27 at page 19, line 14;
New claims 28-31, 40 and 57-59 at page 13, line 10 and page 19, line 16;
New claims 32, 41, 60, 72 and 97 at page 13, line 9;
New claims 33, 34, 43, 62, 70 and 93 at page 10, line 15;
New claims 35, 44 and 63 at page 15, lines 22-23;
New claims 37, 46 and 65 at page 23, lines 1-2;
New claims 38, 47, 66 and 89 at page 23, line 17;
New claims 39 and 76 at page 13, lines 9-13, and page 15, line 7;
New claims 42, 61 and 92 at page 19, line 25;
New claim 48 at page 6, line 11, page 14, lines 8-10, page 15, line 22 through page 16, line 7, page 23, lines 21-29, and Figs. 6A-6D;
New claim 51 at page 22, line 9;
New claim 52 at page 6, line 14;
New claim 53, 54, 73 and 74 at page 6, line 11;
New claim 55 at page 4, line 29;
New claim 56 at page 19, line 14;
New claims 67 and 68 at page 23, lines 1-20, and Fig. 6B;
New claim 69 at page 15, line 22 to page 16, line 7, page 23, lines 21-29, and Figs. 6A through 6D.
New claim 75 at page 6, line 13;
New claim 80 at page 15, lines 22-33;
New claims 81 and 87 at page 14, lines 8-10;
New claims 82, 83 and 98 at page 13, lines 5-9, and 15, line 7;
New claim 85 at page 6, line 21;
New claim 86 at page 4, line 28;
New claims 91 and 99 at page 6, line 18 to page 7, line 12;
New claims 102 and 103 at page 18, lines 10-11; and
New claim 104 at page 19, line 22.

Support for each of the following new claims can be found in Application Serial No. 08/218,319, filed on March 25, 1994, inter alia as follows:

New claims 36, 45, 64, 78 and 94 at page 15, line 7, page 27, line 26 in combination with page 29, line 16;
New claim 77 at page 32, line 5; and
New claims 100 and 101 at pages 9 and 10.

Support for new claim 90 can be found at patent claim 1.

Thus, as can be easily confirmed, the priority date for all claims of the present reissue application (including those listed in the present rejection) is December 3, 1992.

Lai is a publication of an international patent application. Lai was published on May 13, 1993, more than 6 months AFTER the earliest priority date of all claims of the present reissue application. As such, Lai is not prior art to any of the claims of the present reissue application.

35 U.S.C. §102(a) provides, in pertinent part::

35 U.S.C. 102 Conditions for patentability; novelty and loss of right to patent.

A person shall be entitled to a patent unless - -

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent. (Emphasis Added)

As specifically provided by 35 U.S.C. §120², the effective filing date of all claims that are supported by the earlier filed Parent Application is December 3, 1992.

Thus, Lai is not prior art with respect to the current claims of the reissue application. Accordingly, the Examiner's express acknowledgement of the claim to priority would be respectfully appreciated. Moreover, the Applicant respectfully requests a withdrawal of the rejection.

² 35 U.S.C. §120 provides:

35 U.S.C. 120 Benefit of earlier filing date in the United States.

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States, or as provided by section 363 of this title, which is filed by an inventor or inventors named in the previously filed application shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application. (Emphasis Added)

In re Appl. No. 09-34,441 to Lin

Rejection of claims 1, 3, 11-23, 48-68, 81, 87, 88 and 105 under 35 U.S.C. §103(a) in view of Lai and Bille.

In the Office Action, claims 1, 3, 11-23, 48-68, 81, 87, 88 and 105 were rejected under 35 U.S.C. §103(a) as allegedly being obvious in view of Lai and US Patent 4,901,718 to Bille et al. (hereinafter "Bille").

In order for a reference to be a prior art under 35 U.S.C. §103, the reference must also be prior art under 35 U.S.C. §102. See MPEP 2141.01. See also Panduit Corp. v. Dennison Manufacturing Co., 810 F.2d 1561, 1 USPQ2d 1593,1597 (Fed. Cir.), *cert. denied*, 481 U.S. 1052 (1987) ("Before answering [a] 'content' inquiry, it must be known whether a patent or publication is in the prior art under 35 U.S.C. 102.").

As discussed above, the priority date of all claims of the present reissue application is December 3, 1992, which pre-dates Lai. Therefore, Lai is not prior art with respect to claims 1, 3, 11-23, 48-68, 81, 87, 88 and 105.

The present rejection cannot and does not stand on Bille alone, as evidenced by the Examiner's need to combine it with Lai as a primary reference in alleging grounds for the present rejection. Accordingly, it is respectfully requested that the rejection be withdrawn.

Rejection of claims 2 and 4-10 under 35 U.S.C. §103(a) in view of Lai and Bille and in further view of the '630 Patent to Lin.

In the Office Action, claims 2 and 4-10 were rejected under 35 U.S.C. §103(a) as allegedly being obvious in view of Lai and Bille, and in further view of the '630 Patent to Lin.

As discussed herein above, Lai is not prior art to the claims of the present reissue application. Moreover, as discussed, the '630 patent to Lin is by the same inventor as the present application, and thus is also not prior art to the presently rejected claims.

Bille alone cannot and does not support the present rejection, as evidenced by the Examiner's use of two other references to support an alleged

In re Appl. No. 09-34,441 to Lin

obviousness argument. Accordingly, it is respectfully requested that the rejection be withdrawn.

Rejection of claims 99-104 under 35 U.S.C. §103(a) in view of Lai and the '630 Patent.

In the Office Action, claims 99-104 were rejected under 35 U.S.C. §103(a) as allegedly being obvious in view of Lai and the '630 Patent to Lin.

For the reasons already discussed, neither Lai nor the '630 Patent to Lin constitutes prior art with respect to the claims of the present reissue application, which all claim priority from, and are fully supported by, the Parent Application filed on December 3, 1992.

Accordingly, the Applicant respectfully requests that the rejection be withdrawn.

Conclusion

All objections and rejections having been addressed, it is respectfully submitted that the subject application is in condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,



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